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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils,
and Agricultural Engineering

H. T. & S. Office Report No. 181

SHIPPING TESTS WITH WASHINGTON NAVEL ORANGES UNDER CONTROLLED AND STANDARD VENTILATION AND ICE REFRIGERATION FROM TULARE COUNTY AND SOUTHERN CALIFORNIA, DECEMBER 1946 AND FEBRUARY 1947

(In cooperation with the California Fruit Growers Exchange)

By

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California Fruit Growers Exchange

Pomona, California
May 1, 1947

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PERSONNEL

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Loading Point

H. A. Schomer[1/] 1.
D. H. Dewey 1, 2.
E. P. Atrops 2.
E. M. Harvey 1, 2.

Needles, Calif.

G. L. Rygg 1.

Waynoka, Okla.

L. J. Kushman 1.
M. R. Getty 2.

Pomona, Calif.

Alma Clark 1, 2.

California Fruit Growers Exchange

P. W. Peterson 1.
Frank Walker 2.
J. R. MacRill 2.

Belen, N.M.

A. S. Lewis, 1, 2.

District Managers.

A. M. Drury 1.
J. M. Griffin 1.
E. P. Jochimsen 2.
H. A. Lynn 2.
M. D. Anderson 2.

Destination

New York

J. S. Wiant 1, 2.
H. W. Hruschka 1.
J. Kaufman 1.
C. O. Bratley.

Chicago

G. B. Ramsey 1.

New York

J. A. Scanlon 1, 2.

Chicago

C. J. Murray 1.

Santa Fe Railway and Santa Fe Refrigerator Department

D. H. Ausbrook, San Francisco 1.
V. W. Burbank, Fresno 1.
H. L. Barrell, " 1.
W. F. Kearns, Los Angeles 1, 2.
C. A. Mulvihill, Los Angeles 2.
Sidney Meyers, San Bernardino 2.

1/ Nos. 1 and 2 = December and February series, respectively, in which the man participated.

SHIPPING TESTS WITH WASHINGTON NAVEL ORANGES UNDER CONTROLLED AND STANDARD VENTILATION AND ICE REFRIGERATION FROM TULARE COUNTY CALIFORNIA, DECEMBER 1946, AND SOUTHERN CALIFORNIA, FEBRUARY 1947, SEASON 1946-47.

This report is the third on winter shipments of Navel oranges from California under ventilation in comparison with refrigeration. It represents the results of such shipping tests made in December 1946 from Tulare County and in February 1947 from Southern California. These tests were routed over the Santa Fe Railway. Reports on earlier similar tests are as follows: HT&S Office Report No. 163, "Shipping Tests with Washington Navel Oranges under Controlled and Standard Ventilation and Ice Refrigeration from Tulare County and Southern California, December, January, and February, 1944-45", and HT&S Office Report No. 170, "Shipping Tests with Washington Navel Oranges under Controlled and Standard Ventilation and Ice Refrigeration from Tulare County, California, November and December, Season of 1945-46."

The first report just mentioned gives the background for all the ventilation shipping tests, their purpose and the methods employed. None of the material from the earlier tests will be included here. However, experience from it will enter into the general summary of results and recommendations.

The listing below identifies the reports by number with the series of tests covered by each and the routing thereof.

HT&S Office Report No.	Series Number	Year	Month	District	Route	Number of Tests	Number cars
	1	1944	December	Tulare Co.	SP-UP	14	31
163	2	1945	January	" "	" "	11	26
	3	1945	February	So. Calif.	Santa Fe	5	15
170	4	1945	November, December)	Tulare Co.	SP-UP	8	20
181	5	1946	December	Tulare Co.	Santa Fe	10	30
	6	1947	February	So. Calif.	" "	7	20
					Total	55	142

Total number of cars shipped under each of the three services:

Controlled ventilation	57
Standard ventilation	44
Ice refrigeration	41

Regarding the tests covered by the present report, we feel a great obligation to the managers of Exchange Districts and Associations who cooperated in furnishing test loads, sometimes at considerable sacrifice and inconvenience in sending from a single association three cars in one day to one market. We feel also the same obligation to the Santa Fe Railway and its Refrigerator Department. Their representatives in Tulare County and Southern California rendered every possible aid to the tests.

The present series of tests are outlined in full in the body of this report and detailed results are presented in Tables 1-6 and the attached charts (Figs. 1-19). Following is a summary of the findings and recommendations based thereon.

SUMMARY

These tests were made with Washington Navel oranges in December 1946 from Tulare County and in February 1947 from Southern California. All moved over the Santa Fe Railway. There were 17 tests, totalling 50 cars, with 17 cars under controlled ventilation, 16 under standard ventilation, and 17 under ice refrigeration. The procedure followed was the same as employed in the earlier tests and described in U. S. Department of Agriculture H. T. & S. Office Reports 163 and 170, and followed the recommendations in the latter report. Because of the car shortage only four of the present tests could be made with fan cars.

The refrigerated cars, with two exceptions, were billed under rule 249-1 (initial icing; one reicing in transit at Belen).

In general, and despite unseasonably warm weather the cooling of the load by controlled ventilation was more rapid and more satisfactory during the first five days than that by ice refrigeration but during the remainder of the trip refrigeration produced lower temperatures. Prompt cooling at the beginning of the transit period is more important than an equal amount of cooling during the latter part. Data were obtained at destination on weight-loss of fruit in transit, decay, pitting, and aging. Differences in these factors as related to controlled and standard ventilation and ice refrigeration were not commercially significant.

However, in general appearance, freshness, and firmness there was a consistent tendency for the fruit from the ice-refrigerated shipments to be slightly fresher than that from the non-refrigerated shipments, but the differences were described by the USDA and the CFGE observers as being of little or no commercial importance.

Account Sales on the commercial consignments have not been thoroughly analyzed but it seems that the differences noted might have been due as much to differences of grades and sizes as to type of service used during shipments.

RECOMMENDATIONS

Based on results of this season's work our recommendations for modification of ventilation rules are virtually the same as in the last report; "Vents open above 20°F. to _____, standard ventilation thereafter." The designated point would vary with the shipping route and perhaps other conditions as, for example. on the Southern Pacific out of Central California it would generally be Ogden; on the Santa Fe out of both Central and Southern California, Belen or Waynoka; and on the Union Pacific out of Southern California, Ogden.

It has become very clear that vents are not likely to need closing before Sparks or Las Vegas, Nev., or Needles, California.

There has been some question about the operation of fan cars on the above schedule when fans are in "on" position, but we believe that with a 20°F. closing rule west of the designated points an ample margin of safety will be assured.

GENERAL PROCEDURE

The procedure followed in these tests was the same as in previous tests. Each test consisted of three cars (except Test No. 52), comparing controlled and standard ventilation and ice refrigeration. All loads were of 561 boxes with one channel in deck layer, except in test 55, in which the controlled ventilated and the iced cars each carried 500 half-boxes of Ruby Blood oranges, stacked on end two layers deep in the ends of the cars opposite the temperature recording equipment and test boxes. The rest of the car, including all the deck layer, was of standard boxes of Navel oranges. The ventilated cars in tests 42, 50, 51 and 52 were fan cars with fans sealed in the "on" position.

Observers were stationed at Needles, Calif., Belen, N.M., and Waynoka, Okla. to obtain the fruit temperatures in the test cars as they passed these points and perform other duties pertaining to the tests.

In each test car Ryan recording thermometers were placed inside two boxes of oranges in the center line at quarter length in the bottom and middle layer positions. In the ventilated cars these boxes were always at the forward (air intake) end of the car. Each ventilated car also carried four electric resistance thermometers inserted in the fruit at or near the bunkers of the forward end. Temperatures at such positions should represent the coolest fruit and were read at the passing points. In each test car were two boxes of comparable test fruit placed adjacent to the boxes with the Ryan thermometers.

The cars were reversed in transit in only one of the 17 tests (No. 43 out of Orange Cove).

RESULTS

Handling of the vents on the test cars

The weather was so mild along the Santa Fe route west of Waynoka, Okla. during the running of the tests in December 1946 and February 1947 that relatively little closing of vents was required for the standard ventilated cars. No controlled vents were closed at any time west of Waynoka.

Even though there were relatively few closures of test car vents, table 1 has been prepared to allow comparison of the actual handling of the vents with the theoretical possibilities. Column 6 of the table gives the percentage of time the vents of the standard vent cars were open when outside temperatures were above 32°F. Corresponding column 9 gives the percentage of time the controlled vents were open when outside temperatures were above 20°. If the values in columns 6 and 9 are larger than 100 it means that the vents were open for varying periods when the outside temperatures were below 32° or 20°, respectively, and the load received more cooling than a completely strict handling of the vents would allow under the respective rules for vent closing.

Following are further brief notes on the movement, handling, and conditions surrounding the individual tests.

Series 5, from Tulare County.

Test 39. Loaded Dec. 3, 1946. Lindsay Citrus. Out of Bakersfield 11:45 p.m., 12/4. Arrive Needles 2:30 p.m., 12/5; Belen 7:20 p.m., 12/6; Waynoka 9:30 p.m., 12/7.

Lowest outside temperatures encountered to Waynoka were: 45°F. at 8 a.m. 12/5 west of Needles; 46° at 8 a.m. 12/6; and 42° just east of Belen about 1:00 a.m., 12/7. The SV[1]/ vents were evidently closed for short periods near each of these minima outsde temperatures, but the inside top air temperature does not show a clear record. The CV vents were open continuously to Waynoka. The Ref. was billed standard refrigeration and was reiced at Needles with 3748 pounds of ice, at Belen with 700 pounds, and at Waynoka with about 2000 pounds.

Test 40. Loaded Dec. 4. Grand View. Out of Bakersfield 9 a.m. 12/5. Arrived Needles 12:40 p.m., 12/6; Belen 3:40 p.m. 12/7; Waynoka 10 p.m. 12/8.

Lowest outside temperature to Waynoka was 34°F. near Winslow. The SV vents were closed during this period, evidently they were also closed out of Barstow. Total time the SV vents were closed was about 9 hours. The CV vents were not closed. The Ref. car was reiced at Belen with 5000 pounds of ice.

Test 41. Loaded Dec. 5. Hillside Packing Assn. Out of Bakersfield 7:25 p.m. 12/6. Arr. Needles 9:45 a.m. 12/7; Belen 12:40 p.m. 12/8; Waynoka 5 p.m. 12/9.

Minimum outside temperature encountered was 23° near Gallup, N.M. at 6 a.m. 12/8. The SV vents were closed about 14 hours during that period and perhaps two other periods between Needles and Waynoka, giving a possible total closure time of 23 hours. The Ref. car was reiced with 3800 pounds of ice at Belen.

Test 42. Loaded Dec. 6. Grand View. Out of Bakersfield 11:55 p.m. 12/7. Arr. Needles 3:20 p.m. 12/8; Belen 5:55 p.m. 12/9; Waynoka 8:30 p.m. 12/10.

The SV and CV cars were equipped with fans which were sealed in the "on" position. The Ref. car was without fans. The minimum temperature encountered to Waynoka was 26°F. at 6 a.m. 12/9. Other outside minima were

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1/ Throughout these notes SV, CV, and Ref. will refer to standard ventilation, controlled ventilation, and ice refrigerated cars, respectively.

33°F. six hours west of Needles and 29° just east of Belen. The SV vents were closed varying lengths of time during these three temperature minima, probably giving a total closure time of about 14 hours. The CV vents were not closed. The Ref car was reiced at Belen with 4400 pounds of ice.

Test 43. Loaded Dec. 7. Orange Cove Citrus. Out of Bakersfield 11:35 a.m. 12/8. Arr. Needles 1:20 a.m. 12/9; Belen 3:10 a.m. 12/10; Waynoka 7 a.m. 12/11.

These test cars were reversed out of Orange Cove but this was not noticed until too late to justify the trouble of reversing them. Minimum outside temperatures: 36°F. five hours east of Needles; 23° three hours west of Belen; and 22° just east of there. The SV vents were apparently closed continuously from about Kingman to Belen except for a short period in the afternoon of Dec. 9. They were closed in and out of Belen and for six hours after departure. The total closure was probably about 36 hours. The CV vents were not closed. The Ref. car was reiced at Belen, 3600 pounds of ice.

Test 44. Loaded Dec. 9. Strathmore (one car each at Coop., Dist. Orange, and Fruit Growers). Out of Bakersfield 5:49 p.m. 12/10. Arr. Needles 9:30 a.m. 12/11; Belen 11:15 a.m. 12/12; Waynoka 7 p.m. 12/13.

The CV car was bad ordered at Belen, causing about six hours delay of the test cars. Two minima of 40°F. and one of 28° were encountered to Waynoka. The SV vents were closed for a period west of Needles and arrived there closed. They were again closed during a period corresponding to the lowest minimum, a total closure time of about 31 hours. The CV vents were not closed. The Ref car was reiced at Belen with 3700 pounds of ice.

Test 45. Loaded Dec. 10. Exeter Citrus. Out of Bakersfield 5:30 p.m. 12/11. Arr. Needles 9:50 a.m. 12/12; Belen 1:35 p.m. 12/13; Waynoka 6:30 p.m. 12/14.

One minimum temperature of 22°F. east of Gallup at 6 a.m. 12/13 caused the SV vents to be closed about 8 hours. There was a minimum temperature of 34° eleven hours east of Belen. The recorder of inside top air temperature failed to function during this period so there is no indication of how the SV vents were handled. Probably the maximum total time of closure was not more than 10 hours. The CV vents were not closed. The Ref car was reiced at Belen with 3900 pounds of ice.

Test 46. Loaded Dec. 11. Magnolia Citrus. Out of Bakersfield 8:48 p.m. 12/12. Arr. Needles 12:20 p.m. 12/13; Belen 3:40 p.m. 12/14; Waynoka 6 p.m. 12/15.

Rather low minimumoutside temperatures were encountered; the first at least 34°F, possibly to 30°, four hours west of Needles; the second at least 24°, probably to 20° or less, five hours west of Belen; the third 34° eight hours west of Waynoka. (The outside temperature recording needle functioned only on rising temperatures.) These low temperature periods accounted for the SV vents being closed a total of about 20 hours. The CV vents were not closed. Ref. car reiced at Belen, 3700 pounds of ice.

Test 47. Loaded Dec. 12. Exeter Orchard. Out of Bakersfield 3:40 a.m. 12/14. Arr. Needles 7:35 p.m. 12/14; Belen 10:25 p.m. 12/15; Waynoka 11:55 p.m. 12/16.

Lowest outside temperatures were: 25°F. probably over the Tehachapi Pass; 23° eight hours east of Needles; 27° just east of Belen; and 21° near Waynoka. These low temperatures caused the SV vents to be closed a total of about 22 hours. The temperature was 28° at Belen when the test arrived with one forward vent of the SV car closed and the other three open. The car departed with all vents closed. The SV car had vents open on arrival at Waynoka; all cars departed with vents closed. The CV vents were open continuously to Waynoka. The Ref car was reiced at Belen, 4500 pounds of ice.

Test 48. Loaded Dec. 13. Sunland. Out of Bakersfield 12:35 a.m. 12/15. Arr. Needles 4:15 p.m. 12/15; Belen 7:50 p.m. 12/16; Waynoka 9:30 p.m. 12/17.

This test encountered the lowest temperatures of the series. To Waynoka it passed through a total of 25 hours of below 32°F. as compared with the total of 21 hours below 32° for test 47, which itself had encountered more than twice as many hours of sub-freezing weather as any of the preceeding tests. The lowest minima of the present test were 22° and 23°, the morning of the 16th (near Flagstaff ?), and on the 17th seven hours east of Belen, respectively. The SV vents were closed a total of about 37 hours to Waynoka. The CV vents were open continuously to Waynoka. The Ref car was reiced at Belen, 6000 pounds of ice.

Series 6, from Southern California.

Test 49. Loaded Feb. 6, 1947. La Verne Orange. Out of San Bernardino 4:45 p.m. 2/7. Arrived at Belen 10:40 a.m. 2/9; Waynoka 3:05 p.m. 2/10.

The recording thermometer and the record for outside temperatures were lost in transit. SV car vents were closed at Pinta, Ariz. 1:45 a.m. 2/9 and remained closed to Belen but were open on departure. Top air temperature records indicate that the vents were closed about 9 hours west of Belen and about 18 hours between Belen and Waynoka, a total of 27 hours. The CV vents were open continuously to Waynoka. The Ref car was reiced with 4300 pounds of ice at Belen.

Test 50. Loaded Feb. 7. Victoria Avenue Citrus. Out of San Bernardino 1:45 p.m. 2/8. Arr. Belen 5:40 a.m. 2/10; Waynoka 11:30 a.m. 2/11.

The three test cars were equipped with fans sealed "on". The first sub-freezing temperatures (Min. 29°) were encountered just west of Belen. SV car vents were closed at Gallup 1:30 a.m. 2/10, temp. 34°, and arrived at Belen closed but departed open. The second sub-freezing temperature (Min. 25°) occurred five hours west of Waynoka, causing another closure of the SV vents, bring the total closure time to about 20 hours. The CV vents were not closed. The Ref car was reiced at Belen, 5400 pounds of ice. There was a delay of five hours in departing from Belen on account of holding for consolidation of the train.

Test 51. Loaded Feb. 10. La Verne Orange. Out of San Bernardino 3:35 p.m. 2/11. Arr. Belen 5:35 a.m. 2/13; Waynoka 7:25 a.m. 2/14.

All cars were equipped with fans sealed "on". The only sub-freezing temperature was for nine hours just west and east of Belen, (Min. 23°). SV vents were closed at Gallup at 1:30 a.m. 2/13 and remained closed in and out of Belen, a total of about 8-1/2 hours. The CV car vents were not closed. The Ref car was reiced at Belen with 5400 pounds of ice.

Test 52. Loaded Feb. 12. Monte Vista Citrus and National Orange. Out of San Bernardino 1:45 p.m. 2/13. Arr. Belen 10:45 p.m. 2/14; Waynoka 12:40 a.m. 2/16.

This was a two-car test, the only one of the series. The SV car was omitted. The CV and Ref. cars were equipped with fans which were sealed "on". A minimum temperature of 32°F occurred near Kingman and another of 19° just east of Belen. There was a total of nine hours of sub-freezing weather to Waynoka. The CV car vents were not closed. The Ref car was reiced at Belen, 4800 pounds of ice.

Test 53. Loaded Feb. 13. McDermont Fruit. Out of San Bernardino ? 2/14. Arr. Belen 10:30 a.m. 2/16; Waynoka 11 a.m. 2/17.

There was a minimum temperature of 22°F. three hours west of Belen. The SV vents were closed at Flagstaff at 10:15 p.m. 2/15 and remained closed to Belen but departed from there open. Total time of closure approximately 23 hours. The CV vents were not closed. The Ref. car was equipped with fans which were sealed in the "off" position. It received initial icing only.

Test 54. Loaded Feb. 14. Redlands Coop. Out of San Bernardino 1:40 p.m. 2/15. Arr. Belen 2:40 p.m. 2/17; Waynoka 11:50 a.m. 2/18.

Two minima outside temperatures caused closure of the SV vents; one of 34°F. near Belen and the other 29° eight hours west of Waynoka. These vents were closed at Grants at 12:25 a.m. 2/17, arrived at Belen closed but departed open. This car (PFE type) arrived at Waynoka with forward vents closed but the rear ones open. Including this situation as closure, the SV car vents were closed a total of about 24 hours. At Belen this car was bad ordered, which delayed the departure of the test several hours. The vents of the CV car were not closed. The Ref car was equipped with fans sealed in the "off" position. It was reiced at Belen with 4500 pounds of ice.

Test 55. Loaded Feb. 17. Victoria Avenue Citrus. Out of San Bernardino 12:40 p.m. 2/18. Arr. Belen 1:05 a.m. 2/20; Waynoka 2 a.m. 2/21.

The minimum temperatures encountered were 24°F. at 6:00 a.m. 2/19, 21° near Belen, and 20° near Waynoka. The SV vents were closed at Gallup 9:10 p.m. 2/19 and remained closed in and out of Belen. As in test 54, the SV car (PFE type) arrived in Waynoka with forward vents closed and rear ones open. Including this as closure, the SV vents were closed about 33 hours. The vents of the CV car were not closed. The Ref car was reiced at Belen with 3300 pounds of ice.

Records and Observations at Passing-Points.

1. Controlled and standard ventilation.

The fruit temperatures at passing points are presented in table 2, graphically in figures 1 and 2, and in more complete records of observations on two large supplementary folded sheets at the end of the report. These temperatures were obtained from electric resistance thermometers in fruit at certain critical positions in the load and read at the hatches by the observers stationed along the route.

In the December 1946 tests observers were stationed at Needles, Belen, and Waynoka. From the data obtained in that series it was decided as unnecessary to have an observer at Needles in February, but the other stations were manned as before.

The mild weather which prevailed along the shipping route as far as Waynoka during both series of tests reduced the relative importance of the passing-point temperature readings as a guide in manipulation of vents. The lowest fruit temperatures in the controlled ventilation cars at Belen and Waynoka were never within ten degrees of the danger point except in three instances in which the lowest was about six degrees above the fruit freezing temperature. In comparing Belen and Waynoka as a designated point for ending controlled ventilation, it was observed that the amount of additional cooling of the load from Belen to Waynoka was about 1-1/2 degrees, as indicated by the averages from the passing-point records. But if averages are taken from the Ryan thermometer records (table 3) at the middle quarter length position the drop in the load temperature between Belen and Waynoka appears as about five degrees. However, in seven of the present seventeen individual tests the average passing-point fruit temperature actually showed a rise between Belen and Waynoka. The Ryan thermometer records of the load as a whole show such a rise in only two of the tests.

2. Ice refrigerated car.

One ice refrigerated test car was billed standard refrigeration and one initial icing only; all others moved under rule 249-1: thatis, initial icing and one reicing in transit--at Belen.

Heaters

No heaters were involved in the tests.

Records and Observations at Destination.

1. Comparative temperatures of test loads.

Ryan recording thermometer records from the middle and the bottom quarterlength centerline positions are presented in table 3. The MQ temperatures are also shown graphically in figures 3 to 19, inclusive. These records indicate that in eleven of the present seventeen shipping tests the controlled ventilation car cooled faster than the corresponding one under ice refrigeration. In three instances the standard ventilation car also cooled faster than the iced car. This faster cooling, as compared with the iced car, was noticeable only for the first five days. During the latter half of the trip the iced cars almost always showed lower temperatures than the controlled vent cars. This is favorable to controlled ventilation during the first half and unfavorable to it during the second half of the trip but, on the whole, the balance seems slightly in favor of controlled ventilation if a given lowering of load temperature is judged as more important near the loading end than at destination. The very mild weather encountered across Arizona and New Mexico by some of the tests did not allow controlled ventilation to perform as rapid cooling as ice refrigeration.

2. Weight loss of test fruit in transit and during holding at destination.

Table 4 presents the weight losses of test fruit in transit and at destination for tests 39 to 55, inclusive. The fruit was buried in the load at the quarterlength. A comparison of the three types of service with regard to fruit weight-loss in transit, based on the general averages, probably shows no significant differences. It becomes rather clear, however, that whether or not ventilation will cause a greater or less weight-loss in transit than ice refrigeration depends largely on the relative rapidity of the cooling of the load. If temperatures are low enough to favor rapid cooling by ventilation the load will cool faster than under ice refrigeration and loss of weight of the fruit will be less, in spite of exposure of the load to large volumes of outside air. On the other hand, if air temperatures are not low enough for rapid cooling by ventilation (i.e. not below 45°, preferably much lower) the ventilated load will not cool as fast as the ice refrigerated load, and fruit weight-loss will be considerably greater because the ventilated load will be handicapped by both the higher temperature of the fruit and by its exposure to large volumes of outside air. The drying effects of exposure to relatively warm outside air will vary also with its relative humidity, which would be expected to range from that of the dry desert to the saturated air of the tule fog. Air of high relative humidity might offset largely the drying tendency.

Examples of rather unfavorable ventilation conditions are illustrated by tests 43 and 54 (see table 4 and figures 7 and 18) in which the relatively high outside temperature did not allow the ventilated load to cool as fast as the iced load. With a too high outside temperature the fan car under ventilation seems to show an even greater tendency to encourage fruit weight-loss, probably through an increased air circulation. (See records of tests 50 and 51, table 4, and figures 14 and 15). However, with favorable outside temperatures the fan car under ventilation seems to have considerable advantage by reason of this increased air circulation. This is shown in test 42 when minimum temperatures of 33°, 26°, and 29° allowed the controlled vent fan car to lower the load temperature below that under ice refrigeration and, at the same time, did not increase fruit weight-loss, as compared with the latter. (See table 4 and figure 6).

3. Condition of test fruit and notes on commercial loads.

Table 5 presents a summary of the inspection data obtained on test lots on arrival at New York and Chicago and after being held 10 days. No test fruit was held in Chicago. A study of the table does not seem to disclose any significant or consistent tendencies as in particular favor of one service over another. While the records indicate that the differences between the three services in matter of decay, etc. are not generally large enough for statistical conclusions, these differences might be manifest in the appearance of the fruit sufficiently to influence the buyers at destination. It is because of this possibility that the following briefed comments from the inspections of the U. S. Department of Agriculture and the California Fruit Growers Exchange are included.

Series 5, Tulare County, December 1946

Tests 39 and 44, blind packs, and test 46, wrapped pack.

These were the only tests with Chicago as destination. As a summary the following observations were made; USDA, "The quality of the fruit examined from the "C" (test) boxes in tests 39, 44, and 46 received at Chicago was very good. As the data sheets indicate, the color was good and most fruit was classed as firm. An occasional fruit with green mold was seen but was not considered of significance." CFGE: "Fruit from all three test cars reported as in good condition".

Test 40, blind pack. USDA: "Seven observers could find no significant difference between test boxes of the three cars. There was no aging." CFGE: "Report makes no mention of significant difference in the commercial part of the three loads.

Test 41, blind pack. USDA: "The fruit in all (test) packages was firm, fresh, and in excellent condition with practically no decay. There was a little pitting in all packages. Neither in the BQ or MQ test boxes were we able to find significant differences in fruit from the three cars". CFGE: "The fruit in the three shipments was practically alike as to freshness and appearance".

Test 42, blind pack. USDA: "None of the staff was able to detect significant differences in condition of fruit from the three cars." CFGE: " The fruit of the commercial packs of the three cars of test 42 had about the same appearance and freshness, with some variation in color and packs".

Test 43, blind pack. USDA: "No noticeable differences in wilting, dullness, color, firmness or button color could be detected at the pier, in between the fruit from the three cars". CFGE: "We found all the three shipments nearly alike as to freshness and appearance".

Test 44 Described above.

Test 45, wrapped pack. USDA: "No significant difference in condition of test fruit". CFGE: "The three shipments alike as to freshness with considerable variation in color in commercial loads. The Ref. shipment generally was of a good deep color, while the other two loads contained considerable palish fruit. The test boxes of the three loads were nearly alike as to freshness and color".

Test 46 Described above.

Test 47, blind pack. USDA: "All test fruit was fresh, firm, and generally green buttons. No significant difference in condition of fruit from the three cars". CFGE: "Found the three lots similar as to freshness".

Test 48, naked pack. USDA: "No significant difference could be noted in condition of test fruit from the three cars". CFGE: "Found the three lots similar in appearance with about the same amount of softness in each".

Series 6, Southern California, February 1947

Test 49, wrapped pack. USDA: "Comparison of BQ test boxes indicated no commercial difference between cars with respect to freshness and appearance of fruit. Similar comparisons made on MQ boxes showed the SV fruit slightly less desirable than that in the CV and iced car; practically no difference was detected between the latter, although some cooperators thought the iced car fruit was slightly fresher". CFGE: "We found variation in the appearance of the fruit in commercial portions of the three cars. The fruit in the refrigerated shipment was brighter and fresher appearing than in the two non-refrigerated. In the controlled vent shipment the fruit was quite poor in appearance being generally very dull due to white powdery substance which coated most of the oranges. In our examination of the fruit of the test boxes we found but little difference in the three types of shipments." (NB This white powdery substance was a residue from a too strong borax wash -- the commercial load was from a packing house different from the two other test loads).

Test 50, wrapped pack. USDA: "Very little difference was noted between cars with respect to freshness, firmness, etc. of BQ fruit. Some observers thought the fruit from the iced car was slightly the firmest. In comparing the MQ boxes it was found that the SV and iced car fruit was slightly fresher than that of the CV car. In neither case was the difference of commercial importance". CFGE: "Commercial loads and test boxes nearly alike in appearance in all three shipments. We thought the refrigerated shipment was slightly fresher than those from the ventilated cars but not enough to affect them commercially".

Test 51, wrapped pack. USDA: "Fruit from iced car slightly fresher than that from the other two cars but the difference was not of commercial importance." CFGE: "In our comparison of the test boxes out of the three cars we found the fruit from the refrigerated car slightly fresher than that out of the two ventilated cars. In the commercial portion of the load the appearance of the fruit seemed to be in favor of the CV car."

Test 52, wrapped pack. USDA: "There was a marked difference in the amount of pitting in the two cars, considerably more showing up in the CV car (no SV car in this test). Fruit from MQ test boxes definitely softer in the CV car than in the iced car". CFGE: "The bottom layer test boxes in each car about alike in firmness and appearance, but the middle layer test boxes showed the fruit more firm in the refrigerated shipment."

Test 53, wrapped pack. USDA: "The fruit in the SV packages was slightly less fresh than that from the other two cars but the difference was not of commercial importance". CFGE: "Test fruit out of the refrigerated shipment shows slightly fresher when compared with the fruit out of controlled vent and standard vent shipments, with the CV slightly fresher and somewhat firmer".

Test 54, wrapped pack. USDA: "The fruit from the iced car was slightly the freshest in appearance and that from the CV car the least fresh. Differences were not of commercial importance". CFGE: "Found the fruit

out of the refrigerated shipment slightly fresher than that from the ventilated shipments. As between the two non-iced shipments we found the test fruit out of the CV shipment somewhat softer and less fresh than that out of the SV".

Test 55, wrapped pack. USDA: "No differences noted between the three cars". C"GE: "We found both the commercial portion and the test boxes in the three shipments about similar in appearance; all were firm and fresh appearing".

It may be noted from the above comments that the fruit from the standard ventilation test cars arrived at destination in good condition and compared well with that from the controlled-ventilation and ice-refrigerated cars. It seems very probable that this was due to the mildly cool weather prevailing along the shipping route during the period when the tests were run. Such weather allowed the vents of the SV cars to remain open for relatively long periods, which they could not have done had the weather been even slightly below freezing. The results show again that ventilation is important in maintaining fruit quality, even though it may increase shrinkage somewhat.

4. Sales of test shipments.

Table 6 presents the Account Sales from New York and Chicago for the commercial loads of all test shipments.

Table 1. Record of Vents of Controlled and Standard Ventilation Test Cars.

Test		Total Hrs in transit to Waynoka	Total hours vents open to Waynoka	No. hours Temp. below 32°F.	Theoretical[1] Max. time vents should have been open to Waynoka		No. hours Temp. below 20°F.	Theoretical[1] Max. time vents should have been open to Waynoka.	
1		2	3	4	5	6	7	8	9
		Hrs	Hrs	Hrs	Hrs	%	Hrs	Hrs	%
Series 5, Tulare County, Dec. 1946									
39	CV	104	104	0	--	--	0	104	100
	SV	104	79	0	104	76	0	--	--
40	CV	104	104	0	--	--	0	104	100
	SV	104	95	0	104	91	0	--	--
41	CV	99	99	10	--	--	0	99	100
	SV	99	76	10	89	85	0	--	--
42	CVF	103	103	8	--	--	0	103	100
	SVF	103	89	8	95	94	0	--	--
43	CV	89	89	10	--	--	0	89	100
	SV	89	53	10	79	67	0	--	--
44	CV	101	101	4	--	--	0	101	100
	SV	101	70	4	97	72	0	--	--
45	CV	101	101	6	--	--	0	101	100
	SV	101	90(?)	6	95	95(?)	0	--	--
		(Top air Ryan failed to record)							
46	CV	100	100	4(?)	--	--	0	100	100
	SV	100	80(?)	4(?)	96	83(?)	0	--	--
		(Outside air Ryan did not give complete record)							
47	CV	106	106	21	--	--	0	106	106
	SV	106	84	21	85	99	0	--	--
48	CV	104	104	25	--	--	0	104	100
	SV	104	67	25	79	85	0	--	--

1/ On basis CV vents open to 20°; SV vents open to 32°/

NB, Column 2 - Loading point to Waynoka.
" 3 - Observed number of hours vents were actually open.
" 4 - Observed from recorded temperature of the outside air through which the given test passed.
" 5 - Column 2 minus column 4.
" 6 - Column 3 divided by column 5.
" 4 to 6 for SV on basis of 32°F.
" 7 - after same manner as column 4.
" 8 - Column 2 minus column 7.
" 9 - Column 3 divided by column 8.

Table 1. (Cont'd)

Test	Total Hrs in transit to Waynoka	Total hours vents open to Waynoka	No. hours Temp. below 32°F.	Theoretical Max. time vents should have been open to Waynoka		No. hours Temp. below 20°F.	Theoretcial Max. time vents should have been open to Waynoka.	
1	2	3	4	5	6	7	8	9
	Hrs	Hrs	Hrs	Hrs	%	Hrs	Hrs	%
Series 6, Sou. California, Feb. 1947.								
49 CV	97	97	?	--	--	0	97	100
SV	97	70	?	--	--	0	--	--
	(Outside air Ryan lost in transit)							
50 CVF	94	94	18	---	--	0	94	100
SVF	94	74	18	76	97	0	--	--
51 CVF	90	90	9	--	--	0	90	100
SVF	90	81.5	9	81	101	0	--	--
52 CVF	83	83	9	--	--	2	81	103
No SV car.								
53 CV	93	93	6	--	--	0	93	100
SV	93	70	6	87	81	0	--	--
54 CV	94	94	5	--	--	0	94	100
SV	94	70	5	89	79	0	--	--
55 CV	84	84	22	--	--	0	84	100
SV	84	51	22	62	82	0	--	--

Table 2. Fruit Temperatures at Bunkers of Controlled and Standard Ventilated Cars at Passing Points.

CV - Controlled ventilation
SV - Standard ventilation
BB - Bottom bunker
TB - Top bunker

Test	Loading Point	Needles	Belen	Waynoka	Avg.
	°F	°F	°F	°F	°F
Tulare, Dec. 1946					
39 CV BB	70.8 (48)[1]	52.8 (75)	49.0 (49)	52.5 (64)	56.3
TB	71.8	59.3 49[2]	50.7 28 hrs	49.1 26 hrs	57.7
SV BB	65.1	57.9	52.0	53.0	57.0
TB	72.5	59.0	53.6	53.6	59.7
40 CV BB	67.2 (53)	60.7 (68)	55.7 (50)	54.8 (57)	59.6
TB	62.2	60.8 47 hrs	52.9 27 hrs	52.6 30 hrs	57.1
SV BB	65.5	53.3	47.5	51.3	54.4
TB	67.0	59.8	52.5	55.6	58.7
41 CV BB	59.1 (48)	46.9 (60)	40.3 (56)	41.1 (59)	46.9
TB	64.7	57.3 44 hrs	46.6 27 hrs	52.3, 29 hrs	55.2
SV BB	71.8	53.3	53.2	46.9	56.3
TB	70.5	61.0	58.6	55.1	61.3
42 CVF BB	71.5 (59)	50.0 (63)	44.0 (48)	44.1 (44)	52.4
TB	72.7	50.4 49 hrs	42.4 27 hrs	43.0 27 hrs	52.1
SVF BB	68.5	51.3	46.8	44.3	52.7
TB	69.7	54.0	46.5	44.1	53.6
43 CV BB	57.7 (49)	58.4 (53)	No (26)	49.0 (44)	55.0
TB	64.0	57.3 35 hrs	record 26 hrs	47.5 28 hrs	56.3
SV BB	73.9	52.6	DO	47.1	57.9
TB	73.3	62.0	do	55.0	63.4
44 CV BB	67.1 (52)	45.0 (62)	35.5 (54)	45/2 (45)	48.2
TB	66.2	51.6 44 hrs	45.4 26 hrs	44.7 32 hrs	52.0
SV BB	67.0	47.9	47.9	44.6	51.9
TB	69.8	61.4	61.7	52.9	61.5

1/ Figures in parentheses are outside temperatures.

2/ Number of hours in transit from loading point or last previous passing point.

Table 2. (Cont'd)

Test		Loading Point	Needles	Belen	Waynoka	Avg.
		°F	°F	°F	°F	°F
45 CV	BB	64.3 (56)	53.2 (55)	42.2 (64)	44.0 (50)	50.9
	TB	64.6	56.9 44 hrs	49.0 28 hrs	49.9 29 hrs	55.1
SV	BB	68.0	52.7	51.6	47.2	54.9
	TB	67.5	52.0	53.7	49.2	55.6
46 CV	BB	75.5 (50)	45.0 (65)	42.0 (72)	47.3 (53)	52.5
	TB	75.8	58.6 46 hrs	47.1 27 hrs	48.1 26 hrs	57.4
SV	BB	71.9	50.2	46.8	49.3	54.6
	TB	74.4	58.7	55.4	53.9	60.6
47 CV	BB	58.8 (46)	49.5 (55)	45.0 (34)	47.6 (32)	50.2
	TB	60.3	55.9 54 hrs	47.1 27 hrs	41.6 26 hrs	51.2
SV	BB	58.8	49.6	48.1	45.7	50.6
	TB	60.6	55.9	52.9	47.7	54.3
48 CV	BB	64.6 (46)	52.8 (61)	43.7 (40)	33.7 (24)	48.7
	TB	72.6	62.0 50 hrs	50.5 27 hrs	37.5 27 hrs	55.7
SV	BB	69.4	45.2	46.1	46.2	51.7
	TB	66.8	53.4	48.1	49.4	54.4
Southern California, Feb. 1947						
49 CV	BB	63.2 (66)	--	46.3 (40)	43.3 (42)	50.9
	TB	67.6	--	50.3 69 hrs	46.8 26 hrs	54.9
SV	BB	63.4	--	50.5	52.0	55.3
	TB	63.0	--	54.0	55.0	57.3
50 CVF	BB	66.2 (66)	--	52.9 (34)	51.9 (42)	57.0
	TB	68.5	--	52.7 67 hrs	51.5 27 hrs	57.6
SVF	BB	67.5	--	56.1	58.6	60.7
	TB	68.8	--	52.9	55.3	59.0
51 CVF	BB	66.5 (64)	--	54.8 (26)	56.5 (37)	59.3
	TB	66.1	--	51.3 65 hrs	54.7 25 hrs	57 .4
SVF	BB	65.4	--	50.5	54.8	56.9
	TB	66.7	--	49.5	55.4	57.2

Table 3. Daily Average MQ and BQ Temperatures of Test Cars in Transit, Tulare County, December 1946.
(From Ryan recording thermometer tapes.)

Test	Billing	Position	Days 1	2	3	4	5	6	7	8	9	10	11	12	13	Avg.
			°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Tulare, Dec. 1946.																
39	CV	MQ	66.7	64.3	55.8	48.8	45.8	51.3	55.0	56.3	54.3	51.5,	51.0			54.6
Chi		BQ	68.0	56.4	51.5	50.8	48.8	56.0	59.8	53.8	51.0	48.5	48.0			53.9
	SV	MQ	69.0	66.6	59.8	53.5	50.8	52.8	55.3	57.0	56.8	56.0	56.0			57.6
		BQ	65.3	55.6	49.3	47.2	45.1	52.0	56.3	54.8	46.8	44.0	43.0			50.8
	Ref	MQ	69.0	68.2	62.5	55.5	51.0	46.5	44.3	42.0	42.0	41.0	40.0			51.1
		BQ	64.7	56.0	40.4	31.8	28.3	26.8	26.0	26.0	25.8	25.0	25.0 1/			34.2
40	CV	MQ	67.5	67.4	61.8	53.6	50.4	51.8	53.3	51.5	51.0	50.3	47.5	46.5	45.3	53.7
NY		BQ	64.7	60.3	56.5	51.3	48.7	52.8	54.0	46.0	45.8	45.3	40.0	39.8	38.5	49.5
	SV	MQ	68.0	67.5	64.3	58.8	53.8	53.7	54.3	51.3	51.0	51.8	50.0	49.0	47.5	55.4
		BQ	62.7	56.4	55.6	52.5	50.0	53.9	54.5	47.0	47.8	49.0	42.8	41.8	40.5	50.3
	Ref	MQ	69.3	71.2	66.6	60.8	55.3	51.1	48.5	46.8	46.0	45.8	45.0	44.3	43.0	53.3
		BQ	69.2	64.3	52.1	45.8	42.3	40.3	40.0	39.5	39.0	39.0	38.8	37.8	36.8	45.0
41	CV	MQ	65.0	64.3	58.0	49.3	44.6	45.0	43.8	44.5	47.0	48.0	48.3	49.0	49.0	50.4
NY		BQ	59.5	50.3	46.2	40.8	38.7	42.3	40.3	39.5	42.3	43.5	44.0	44.5	41.0	44.1
	SV	MQ	64.0	67.6	65.8	62.8	58.8	56.5	53.8	52.5	52.0	51.5	52.0	52.5	52.0	57.0
		BQ	65.0	64.7	57.6	54.8	50.4	49.9	46.5	48.5	49.5	49.0	49.0	48.5	45.5	52.2
	Ref	MQ	64.3	67.3	63.4	57.6	52.7	49.1	46.5	45.0	45.0	44.0	43.3	43.0	42.0	51.0
		BQ	60.2	56.2	45.7	40.3	37.6	36.6	36.0	36.0	37.0	36.3	36.0	35.3	35.0	40.6

1/ The BQ temperatures of this line are not correct as they stand, the correction factor not available when table was made.

Table 3. (con't)

Test	Billing	Position	Days 1 °F	2 °F	3 °F	4 °F	5 °F	6 °F	7 °F	8 °F	9 °F	10 °F	11 °F	12 °F	13 °F	Avg. °F
42	CVF	MQ.	65.7	64.4	51.1	39.8	37.5	40.8	43.3	41.5	40.3	40.0	41.0	41.0		45.5
NY		BQ	63.8	58.8	52.9	45.3	40.0	41.8	44.8	43.5	43.0	42.0	41.3	38.8		46.3
	SVF	MQ	65.7	65.0	56.8	48.6	41.3	42.4	45.3	44.0	42.3	41.0	41.8	42.0		48.0
		BQ	63.7	57.6	52.3	47.9	42.0	42.0	43.8	42.8	41.5	41.0	40.3	38.0		46.1
	Ref.	MQ	67.5	69.1	63.3	56.8	51.6	47.5	44.8	43.0	41.5	40.3	39.5	38.8		50.3
		BQ	65.2	61.0	49.0	42.5	39.0	37.5	37.0	36.3	35.0	34.3	34.0	34.0		42.1
43	CV	MQ	62.8	66.5	62.8	54.9	52.2	52.0	51.0	49.8	49.0	47.5	46.3	45.0		53.3
NY		BQ	60.2	57.9	54.8	48.1	46.8	47.8	44.5	41.3	39.5	38.0	36.0	36.0		45.9
	SV	MQ	60.7	63.8	61.5	59.5	57.5	56.8	55.3	53.8	53.0	52.8	50.5	48.8		56.1
		BQ	56.3	51.3	47.7	45.5	45.6	47.8	46.0	42.3	40.3	39.3	37.8	38.0		44.8
	Ref	MQ	60.5	62.7	56.0	50.1	44.9	42.5	40.5	39.8	39.0	38.3	38.0	37.8		45.8
		BQ	59.7	56.0	44.7	40.4	37.6	37.0	36.8	35.5	35.3	34.3	34.0	34.0		40.4
44	CV	MQ	No record		-	46.5	45.5	45.0	45.3	46.0	46.0					45.7
Chi		BQ	63.8	55.3	46.2	39.5	37.8	39.3	38.0	38.0	38.0					44.0
	SV	MQ	64.2	60.8	57.8	55.3	49.4	47.5	48.0	48.0	48.0					53.2
		BQ	64.8	52.3	46.4	46.1	42.7	41.8	41.0	40.3	40.0					46.1
	Ref	MQ	65.2	65.8	60.9	55.8	51.6	48.7	46.5	44.5	43.5					53.6
		BQ	64.3	59.8	48.8	43.4	40.1	38.5	37.8	36.9	36.0					45.0
45	CV	MQ	65.2	64.4	60.7	53.9	50.3	49.3	47.8	44.8	43.0	44.0				52.3
NY		BQ	65.7	60.0	53.4	44.8	41.2	42.8	42.3	37.3	35.0	35.8				45.8
	SV	MQ	63.5	62.9	59.9	56.8	53.2	50.8	48.3	45.0	44.0	43.0				52.7
		BQ	64.3	59.0	51.8	49.8	46.0	45.8	42.0	37.3	35.3	36.0				46.7
	Ref	MQ	63.0	63.4	59.1	53.8	49.3	45.8	43.5	42.0	40.3	39.0				49.9
		BQ	63.5	57.5	46.0	39.0	35.8	34.3	33.0	33.0	32.3	31.3				40.6

Table 3. (con't)

Test	Billing	Position	Days 1	2	3	4	5	6	7	8	9	10	11	12	13	Avg.
			°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
46 Chi	CV	MQ	75.7	72.7	61.4	49.3	44.6	46.5	47.0	48.0						55.6
		BQ	74.5	60.8	49.8	43.4	42.2	46.8	46.5	45.8						51.2
	SV	MQ	76.0	72.6	63.0	55.5	51.5	51.0	51.3	52,0	52.0					58.3
		BQ	75.8	65.0	53.3	46.7	45.0	48.5	48.0	47.5	46.3					52.9
	Ref	MQ	No record		-	-	-	-	-	-	-					-
		BQ	72.5	63.1	50.9	43.8	40.4	39.0	38.0	36.3	36.0					46.7
47 NY	CV	MQ	48.2	52.9	53.2	49.8	46.1	46.0	47.0	48.0	48.3	48.5	47.3			48.7
		BQ	51.2	52.0	49.5	46.1	44.3	44.0	44.0	44.3	43.0	42.8	41.5			45.7
	SV	MQ	51.3	57.8	57.2	55.3	52.0	50.0	51.0	51.5	52.3	52.8	51.0			52.9
		BQ	52.7	51.8	48.4	48.7	47.5	45.3	45.8	45.3	44.8	43.8	41.3			46.8
	Ref	MQ	59.3	62.0	63.1	58.5	54.3	49.5	46.0	43.5	41.8	40.3	40.0			50.7
		BQ	57.0	59.9	55.1	45.6	41.9	39.0	37.3	36.0	35.3	35.0	35.0			43.4
48 NY	CV	MQ	76.7	70.5	65.0	56.8	47.9	42.8	43.0	43.5	44.0	44.0	44.0			52.6
		BQ	81.5	67.0	54.1	46.2	38.3	33.3	33.8	34.8	36.0	37.0	38.0			45.4
	SV	MQ	80.7	69.8	61.1	53.4	48.8	47.5	48.5	48.5	49.5	49.5	49.5			55.2
		BQ	80.7	62.3	47.4	44.9	44.0	45.0	45.0	45.0	44.3	44.0	44.0			49.7
	Ref	MQ	80.5	78.3	71.3	63.7	57.7	52.5	48.3	45.5	43.5	42.3	41.0			56.8
		BQ	76.8	68.0	53.6	44.7	40.2	36.8	35.3	34.0	33.8	33.0	33.0			44.5

Table 3. (Cont'd)

Test	Billing	Position	Days 1 °F	2 °F	3 °F	4 °F	5 °F	6 °F	7 °F	8 °F	9 °F	10 °F	11 °F	12 °F	Avg. °F
Southern California, Feb. 1947.															
49	CV	MQ	63.3	66.4	62.9	53.6	44.7	42.0	42.0	42.0	42.0	42.0	42.0		49.35
NY		BQ	63.3	61.7	55.8	46.0	36.5	35.5	36.3	37.0	37.5	38.3	39.0		44.26
	SV	MQ	60.9	65.1	61.3	56.3	53.3	49.5	47.5	46.5	45.3	44.3	44.0		52.18
		BQ	63.9	61.4	55.8	50.5	46.3	41.5	40.0	40.0	4.00	40.0	39.0		47.10
	Ref	MQ	64.4	65.1	61.0	57.6	54.3	50.5	48.0	45.5	44.3	43.0	43.0		52.4
		BQ	66.0	61.8	50.3	44.8	41.3	38.0	37.0	36.0	35.5	36.0	35.0		43.8
50	CVF	MQ	73.0	72.3	65.0	52.0	44.4	42.0	40.3	39.5	38.3	38.3	39.0		49.5
NY		BQ	66.1	62.1	59.3	53.7	47.5	42.8	42.0	40.0	39.5	39.0	38.0		48.2
	SVF	MQ	68.0	69.0	62.5	53.6	47.1	43.5	42.8	39.5	38.5	38.0	38.0	39.0	48.3
		BQ	72.4	69.8	64.2	57.0	50.0	45.5	43.5	40.8	39.5	39.0	39.0	38.5	49.9
	Ref.F	MQ	70.0	68.9	56.3	46.1	40.4	37.0	36.0	35.3	35.0	35.0	35.0	35.8	44.2
		BQ	70.4	64.3	56.1	49.0	44.3	40.3	38.3	37.0	36.3	36.0	35.0	34.3	45.1
51	CVF	MQ	65.3	66.3	60.3	49.3	46.5	46.3	44.5	43.0	43.0	43.0	43.3		50.1
NY		BQ	66.0	64.4	60.9	54.1	49.9	47.8	45.8	44.0	44.0	42.0	46.5		50.9
	SVF	MQ	64.6	65.0	Ryan failed to record.										
		BQ	65.6	63.8	61.0	55.7	52.4	50.0	47.5	46.0	45.0	42.8	40.8		51.9
	Ref.F	MQ	67.9	66.1	57.1	47.3	42.1	39.5	38.0	37.0	36.0	36.0	37.0		45.8
		BQ	63.1	55.5	52.0	48.9	44.3	41.3	39.8	38.5	37.0	37.0	36.3		44.9

Table 3. (cont'd)

Test	Billing	Position	Days 1 °F	2 °F	3 °F	4 °F	5 °F	6 °F	7 °F	8 °F	9 °F	10 °F	11 °F	12 °F	Avg. °F
52	CVF	MQ	68.4	66.8	61.0	52.4	49.5	46.5	46.5	45.0	43.5	43.0	43.5	44.0	50.8
NY		BQ	67.3	64.0	60.2	54.7	51.2	48.5	47.5	45.8	44.3	42.0	39.0	37.3	50.2
	Ref.F	MQ	69.3	69.1	57.0	47.0	42.2	38.8	38.8	37.0	35.3	35.3	36.0	36.0	45.2
		BQ	68.5	64.7	57.0	49.8	45.2	41.5	39.5	38.3	36.8	36.0	35.0	35.0	45.6
53	CV	MQ	57.4	62.0	59.7	50.9	45.5	43.5	43.0	43.0	43.0	43.0	43.0	43.0	48.1
NY		BQ	60.4	61.6	57.0	47.3	43.4	43.3	41.5	40.0	38.8	37.8	37.0	37.0	45.4
	SV	MQ	59.6	62.6	60.2	57.3	52.9	48.8	48.0	48.0	48.0	47.0	46.5	46.0	52.1
		BQ	60.4	59.8	54.9	54.6	47.5	43.5	41.5	40.8	40.0	39.5	39.0	39.0	46.7
	Ref	MQ	65.0	66.2	61.3	57.3	54.0	50.8	47.5	45.3	43.3	42.0	41.0	40.0	51.1
		BQ	61.0	56.3	43.8	41.0	39.8	38.5	36.5	35.8	35.0	35.0	34.3	34.3	40.9
54	CV	MQ	73.1	77.3	70.6	61.4	53.9	49.0	49.8	49.8	49.0	48.8	48.0	47.5	56.5
NY		BQ	76.4	71.0	62.1	52.9	46.0	41.0	42.0	41.5	40.8	39.8	39.0	39.5	49.3
	SV	MQ	74.0	76.7	74.0	68.6	63.6	58.3	56.5	55.5	53.3	51.5	50.3	49.0	60.9
		BQ	74.0	70.7	64.8	58.3	53.2	47.5	46.8	44.5	42.8	41.3	40.3	40.0	52.0
	Ref	MQ	71.0	70.6	64.8	59.1	54.4	49.5	46.3	44.5	42.8	41.8	40.5	40.0	52.1
		BQ	69.0	65.7	Ryan failed to record										--
55	CV	MQ	70.0	Ryan failed to record											--
NY		BQ	68.7	62.3	52.1	40.9	35.2	36.8	37.0	37.0	37.0	36.3			44.3
	SV	MQ	70.0	70.0	67.2	63.8	61.5	59.3	57.5	56.0	54.5	52.0			61.2
		BQ	67.1	62.8	56.6	51.7	48.0	45.8	42.8	40.0	38.0	37.0			49.0
	Ref	MQ	66.0	66.2	62.4	58.2	54.3	50.0	47.0	45.0	43.3	42.3			53.5
		BQ	66.0	57.9	48.3	43.5	40.8	38.5	37.0	36.3	36.0	36.0			44.0